TISHK INTERNATIONAL UNIVERSITY

FACULTY OF APPLIED SCIENCE
NUTRITION AND DIETETICS DEPARTMENT
NUTRITIONAL BIOCHEMISTRY I/ QUESTION BANK THEORY

Multiple-Choice Questions

Choose the correct answer for each question.

1. Who is known as the "Father of Nutrition and Chemistry"?
   a) Carl Neuberg
   b) Antoine Lavoisier
   c) Thomas Earl
   d) Robert Boyle

2. The term *Biochemistry* was coined in:
   a) 1770
   b) 1903
   c) 1928
   d) 1945

3. Nutritional Biochemistry focuses mainly on:
   a) Anatomy of the human body
   b) Chemical properties and metabolism of nutrients
   c) Genetic inheritance
   d) Behavioral psychology

4. The amount of heat required to raise the temperature of 1 gram of water by 1°C is called:
   a) Joule
   b) Calorie
   c) Energy coefficient
   d) Heat unit

5. The **Basal Metabolic Rate (BMR)** represents:
   a) Maximum working capacity of the body
   b) Energy used during sleep
   c) Minimum energy expenditure at rest
   d) Energy required for digestion

6. Which of the following conditions is required to measure BMR?
   a) Post-absorptive state
   b) After exercise
   c) At high temperature
   d) After a heavy meal

7. In indirect BMR measurement, energy is estimated by:
   a) Heat generated
   b) Calorimeter
   c) Oxygen and carbon dioxide consumption
   d) Blood sugar level

8. What percentage of metabolic energy is converted to ATP?
   a) 10%
   b) 40%
   c) 60%
   d) 80%

9. The **Dietary Reference Intakes (DRIs)** include all except:
   a) RDA
   b) AI

c) BMR
d) UL

10. The **Recommended Dietary Allowance (RDA)** covers the needs of:
    a) 50% of the population
    b) 70–80% of people
    c) 97–98% of people
    d) All individuals

11. Essential nutrients are:
    a) Synthesized by the body
    b) Needed in trace amounts only
    c) Must be obtained from diet
    d) Produced by the liver

12. **Malnutrition** is a pathological state resulting from:
    a) Overeating only
    b) Nutrient imbalance, deficiency, or excess
    c) Infection and stress
    d) Physical inactivity

13. **Over-nutrition** can lead to:
    a) Starvation
    b) Atheroma and obesity
    c) Kwashiorkor
    d) Nutrient depletion

14. **Under-nutrition** occurs when:
    a) Too many nutrients are consumed
    b) Energy output is higher than intake
    c) The person eats excessively
    d) There is food allergy

15. The **thermogenic effect of food** refers to:
    a) Energy required for digestion and absorption
    b) Energy loss during sweating
    c) Energy used for mental activity
    d) None of the above

16. Which of the following food groups are high in calcium and protein?
    a) Fruits and vegetables
    b) Meat and fish
    c) Milk, cheese, yoghurt
    d) Bread and cereals

17. A **balanced diet** includes:
    a) Equal calories from all nutrients
    b) Adequate amounts of all necessary nutrients
    c) Maximum protein and minimal fat
    d) Only plant-based foods

18. The **thermic effect of food** constitutes approximately:
    a) 5% of metabolic demand
    b) 10% of metabolic demand
    c) 25% of metabolic demand
    d) 40% of metabolic demand

19. Which statement best describes **pharmacological effects of nutrients**?
    a) The same as normal dietary functions
    b) Occur at doses higher than food levels
    c) Have no therapeutic value
    d) Involve only vitamins

20. The **daily calorie requirement** for an adult performing heavy work is approximately:
    a) 1,500 kcal
    b) 2,000 kcal
    c) 2,700–3,500 kcal

21. d) 4,500 kcal

21. Which component of energy expenditure accounts for the **largest proportion** of total daily energy use?
    a) Thermogenic effect of food
    b) Physical activity
    c) Basal Metabolic Rate (BMR)
    d) Digestive metabolism

Answer: c) Basal Metabolic Rate (BMR)

22. Which of the following is **NOT** a characteristic of a healthy diet?
    a) Provides adequate macronutrients and micronutrients
    b) Increases risk of chronic disease
    c) Is safe and low in harmful substances
    d) Meets energy needs

Answer: b) Increases risk of chronic disease

23. The **Recommended Dietary Allowance (RDA)** is primarily used to:
    a) Determine food composition
    b) Prevent nutrient toxicity
    c) Plan and assess the nutrient intake of individuals
    d) Measure metabolic rate

Answer: c) Plan and assess the nutrient intake of individuals

1. Metabolism refers to:
A. Only energy-producing reactions
B. Only synthesis reactions
C. All chemical reactions in living cells
D. Only digestion processes

2. Catabolic reactions are characterized by:
A. Energy consumption
B. Breakdown of complex molecules
C. Formation of peptide bonds
D. Storage of ATP

3. **Anabolic reactions mainly involve:**
A. Oxidation of glucose
B. Breakdown of proteins
C. Synthesis of complex molecules
D. Heat production

4. The major fuel molecules for energy production include:
A. Vitamins and minerals
B. Carbohydrates, fats, and amino acids
C. Nucleic acids only
D. Enzymes

5. ATP is best described as:
A. A storage lipid
B. A structural protein
C. A universal energy carrier
D. A nucleic acid

6. ATP consists of:
A. Adenine, ribose, and two phosphate groups
B. Adenine, ribose, and three phosphate groups
C. Adenine and glucose
D. Ribose and nitrogen

7. High-energy phosphate bonds are directly used for:
A. Heat loss
B. Energy-requiring cellular processes
C. Storage in cytoplasm
D. DNA synthesis only

8. The final products of biological oxidation include:
A. ATP only
B. CO_2, H_2O, and energy
C. Glucose and oxygen
D. Proteins

9. Acetyl-CoA is formed from:
A. Glucose
B. Lactate
C. Pyruvate
D. Glycogen

10. Basal metabolic rate accounts for approximately:
A. 10%
B. 30%
C. 60–70%
D. 90%

Brief Explanation Questions

1. **Differentiate between essential and non-essential nutrients with examples.**
   Answer: Essential nutrients cannot be synthesized by the body (e.g., vitamins, essential amino acids) and must come from diet. Non-essential nutrients (e.g., glucose, cholesterol) can be synthesized internally if not provided by food.
2. **Explain the main components of energy expenditure and their significance.**
   Answer: Energy expenditure includes BMR (resting energy use), thermogenic effect of food (energy for digestion), and physical activity (energy for movement). Together, they maintain energy balance and support physiological functions.
3. **Describe the effects of malnutrition and differentiate between over- and under-nutrition.**
   Answer: Malnutrition can cause pathological states due to nutrient deficiency or excess. Over-nutrition leads to obesity and metabolic diseases, while under-nutrition causes weakness and starvation.

Section C: Matching Questions (5 Marks)

Column A	Column B
1. EAR	a. Highest intake level with no adverse effects
2. RDA	b. Nutrient requirement for 50% of a population
3. UL	c. Daily intake meeting 97–98% of healthy people
4. AI	d. Used when RDA not established
5. AMDR	e. Range of energy from each macronutrient

Answer Key: 1–b, 2–c, 3–a, 4–d, 5–e

MCQs (Multiple-Choice Questions)

1. Which of the following provides 4 kcal/g?

a. Protein
b. Fat
c. Carbohydrates
d. Vitamins

Correct answer: c

2. The simplest component of carbohydrates is:

a. Fructose
b. Glucose
c. Maltose
d. Sucrose

Correct answer: b

3. Carbohydrate digestion starts in the:

a. Stomach
b. Mouth
c. Small intestine
d. Colon

Correct answer: b

4. Which of the following is *not* required in the diet because it can be synthesized by animals?

a. Fructose
b. Ribose
c. Glucose
d. Sucrose

Correct answer: b

5. The normal range of blood glucose is:

a. 50–80 mg/dL
b. 80–120 mg/dL
c. 120–180 mg/dL
d. 180–200 mg/dL

Correct answer: b

6. Fats provide how many kcal per gram?

a. 4 kcal
b. 5 kcal
c. 7 kcal
d. 9 kcal

Correct answer: d

7. Essential fatty acid deficiency results in:

a. Rickets
b. Scurvy
c. Phrynoderma
d. Edema

Correct answer: c

8. The basic building block of proteins is:

a. Glucose
b. Fatty acids
c. Amino acids
d. Nucleic acids

Correct answer: c

9. The biological value (BV) refers to:

a. Nitrogen eaten that is absorbed
b. Percentage of absorbed nitrogen retained
c. Total protein content
d. Caloric value per gram

Correct answer: b

10. Recommended daily dietary fiber intake (FAO/WHO) is:

a. 20 g
b. 30 g
c. 40 g
d. 60 g

Correct answer: c

Short Explanation Questions

1. Explain the difference between simple and complex carbohydrates.

Simple carbs include mono-, di-, oligo-, and polysaccharides; they are quickly digested. Complex carbs include starch, glycogen, and fiber; they are digested slowly and provide sustained energy.

2. Why is bile important for fat digestion?

Bile emulsifies fats, increasing their surface area so lipase can break them down into fatty acids and glycerol.

3. What is glycemic index (GI)?

GI measures the blood glucose response to a carbohydrate-containing food compared to a reference food. It indicates how fast a carbohydrate raises blood sugar.

4. What happens when protein deficiency occurs?

Low protein intake leads to anemia, hypoalbuminemia, edema, and in infants, physical and mental retardation. Severe deficiency causes protein-calorie malnutrition.

5. What is the importance of essential fatty acids (EFA)?

EFAs maintain cell membrane structure, support growth, and help inflammatory and immune processes. The body cannot synthesize them, so they must be in the diet.

Drawing Tasks

1. Draw the classification chart of carbohydrates.

Include:

- Simple (mono-, di-, oligo-, poly-)
- Complex
- Examples: glucose, fructose, sucrose, starch, glycogen, cellulose.

2. Draw the metabolic pathway of fat digestion.

Include:

- Fat → emulsified by bile → lipase → fatty acids + glycerol → re-esterification → triglycerides.

3. Draw the structure of a triglyceride.

Label:

- Glycerol backbone
- Three fatty acid chains
- Ester bonds

4. Draw a simple diagram showing protein digestion.

Include stages:

- Stomach (pepsin)
- Small intestine (proteases)
- Absorption of amino acids into bloodstream.

5. Draw the biological value (BV) concept.

A simple diagram showing:
Protein eaten → absorbed N → retained N → % retention = BV.